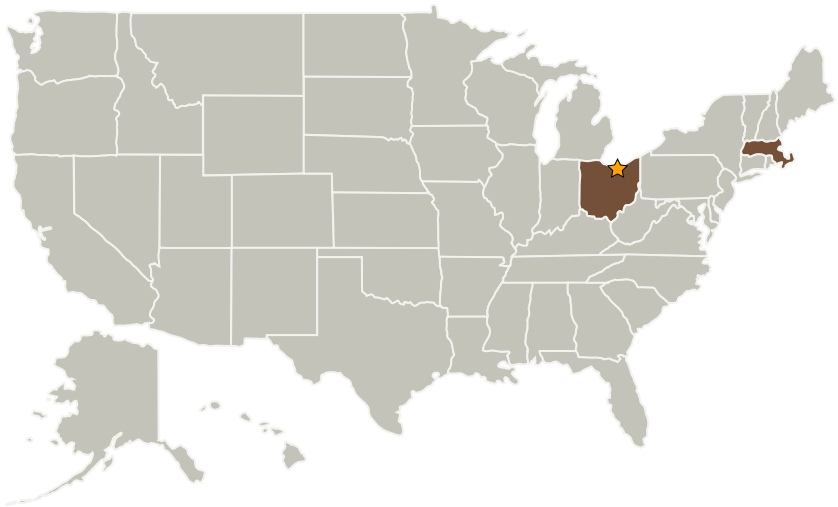
# Novel Catalyst Development for Synthetic Endothermic Fuels, Phase I

Completed Technology Project (2008 - 2008)

## Project Introduction

Physical Sciences Incorporated (PSI) and United Technologies Research Center (UTRC) propose to develop, characterize, and evaluate the performance of innovative nanocatalysts that are homogeneously dispersed (0.01 % - 0.1 % by wt.) within a synthetic endothermic hydrocarbon fuel for ramjet, scramjet, and Rocket-Based Combined-Cycle (RBCC) applications. Coke build-up will be significantly reduced since the catalyst will be expelled with the product gases and liquids from the cracking system into the combustion zone. Increased cracking efficiencies will result using the nanocatalyst due to the higher surface area/volume and dramatically enhanced settling times compared to conventional microcatalysts. As a result, higher heat sinks due to endothermic cracking will be obtained. The reaction product distribution and efficiencies of the nanocatalytic hydrocarbon cracking reaction will be measured using standard chromatography methods. Use of the alternative synthetic fuel is advantageous due to its low sulfur content, high thermal stability, high endotherm, and production through a non-petroleum based reaction. In Phase II, new nanocatalysts will be synthesized, characterized, and tested. Catalytic efficiency will be optimized. The implications of the nanocatalyst on combustion performance will be evaluated. This program comprises TRLs 1 through 3 within Phase 1.

## Primary U.S. Work Locations and Key Partners

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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Glenn Research Center (GRC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

**Small Business Innovation Research/Small Business Tech Transfer**

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Glenn Research Center(GRC) | Lead Organization | NASA Center | Cleveland, Ohio |
| Physical Sciences, Inc. | Supporting Organization | Industry | Andover, Massachusetts |

| Primary U.S. Work Locations | |
|---|---|
| Massachusetts | Ohio |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Bryan Bergeron

## Technology Areas

**Primary:**

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.3 Lasers